



**U.S. Army
Environmental
Center**

**NO FURTHER ACTION
DECISION DOCUMENT
FOR STUDY AREA P33, GROUND SCAR,
AT FORT DEVENS
SUDBURY TRAINING ANNEX**

FINAL DOCUMENT

CONTRACT DAAA15-90-D-0019

**U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND**

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APRIL 1995

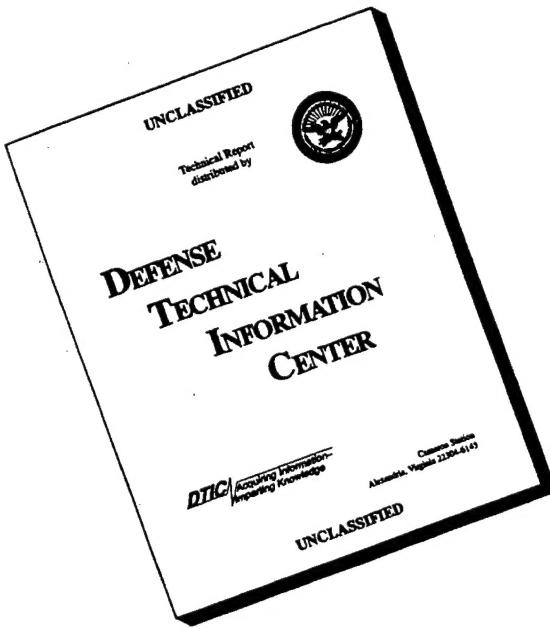
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1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE 4/12/95	3. REPORT TYPE AND DATES COVERED Final No Further Action Decision Document
4. TITLE AND SUBTITLE No Further Action Decision Document for Study Area P33, Ground Scar, Fort Devens Sudbury Training Annex		5. FUNDING NUMBERS C	
6. AUTHOR(S) Noel Novak-Schulz OHM Remediation Services Corp.		7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) OHM Remediation Services Corp. 200 Horizon Center Blvd. Trenton, New Jersey 08691-1904	
8. PERFORMING ORGANIZATION REPORT NUMBER DAAA15-90-D-0019 Task Order No. DA06 OHM Project No.14316		9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) United States Army Environmental Center Aberdeen Proving Ground, MD 21010-5401	
10. SPONSORING/MONITORING AGENCY REPORT NUMBER SFIM-AEC-IR-CR-95017		11. SUPPLEMENTARY NOTES This report is a revision of a draft final report issued in February 1995.	
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This report is a Final No Further Action Decision Document for Study Area P33, Ground Scar at the Fort Devens Sudbury Training Annex located in Sudbury, Massachusetts. This NFADD explains why no further investigation or remediation is required at Area P33. Results of the site reconnaissance are reviewed.			
14. SUBJECT TERMS No Further Action CERCLA (Superfund) Sudbury Training Annex		15. NUMBER OF PAGES	
		16. PRICE CODE NA	
17. SECURITY CLASSIFICATION OF REPORT unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT unclassified	20. LIMITATION OF ABSTRACT SAR

NSN 7540-01-280-3500

Standard Form 298 (Rev. 1-89)
Prescribed by ANSI Std Z39-18
GPO: 1994 OMB Control Number 2900-0423

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AMSL	- Above Mean Sea Level
Annex	- Fort Devens Sudbury Training Annex
BGS	- Below Ground Surface
CERCLA	- Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFHA	- Capehart Family Housing Area
CX	- Categorical exclusion
DOD	- U.S. Department of Defense
EM	- Electromagnetics
FEMA	- Federal Emergency Management Agency
FID	- Flame Ionization Detector
IRP	- Installation Restoration Program
MEP	- Master Environmental Plan
NEPA	- National Environmental Policy Act of 1969
NFADD	- No Further Action Decision Document
OHM	- OHM Remediation Services Corp., A Wholly-Owned Subsidiary of OHM Corporation
PA/SI	- Preliminary Assessment/Site Investigation
PCBs	- Polychlorinated Biphenyls
PID	- Photoionization Detector
POL	- Petroleum, Oil, or Lubricants
QM R&E	- Quarter Master Research and Engineering

GLOSSARY OF ACRONYMS AND ABBREVIATIONS
(CONTINUED)

RBC	- USEPA Region III Risk-based Concentration
ROTC	- Reserve Officer Training Corps
SARA	- Superfund Amendments and Reauthorization Act of 1986
SI	- Site Investigation
SI/RI	- Site Investigation/Remedial Investigation
SM	- Scanning Magnetometry
SMCLs	- Safe Drinking Water Act National Secondary Drinking Water Standards
TAL	- Target Analyte List
TCL	- Target Compound List
USAF	- U.S. Air Force
USAEC	- U.S. Army Environmental Center
USATHAMA	- U.S. Army Toxic and Hazardous Materials Agency
USEPA	- U.S. Environmental Protection Agency
USGS	- U.S. Geological Survey
µg/g	- Micrograms per gram
µg/L	- Micrograms per liter

EXECUTIVE SUMMARY

Investigation of Area P33, Ground Scar, at the Fort Devens Sudbury Training Annex has resulted in the decision that no further studies or remediation are required at this study area. Area P33 was identified by the USEPA in the Installation Assessment (USEPA, 1982) as a potential area of concern.

The Fort Devens Sudbury Training Annex was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 on February 21, 1990. In accordance with these acts and the U.S. Army Installation Restoration Program, a Master Environmental Plan has been initiated and an enhanced area reconnaissance has been conducted, both of which address Area P33.

Field investigation of Area P33 was conducted in 1992 in conjunction with the Site Investigation/Remedial Investigation of sixty-eight study areas on the Annex. The field investigation consisted of an enhanced area reconnaissance. No evidence of contamination was observed. It appears that the ground scar as identified in the aerial photography was related to local farm activity.

Based on the results of the study, it was determined that there is no evidence or reason to conclude that activities at Area P33 have caused environmental impact or pose a threat to human health or the environment.

SECTION 1.0 INTRODUCTION

This decision document has been prepared to support a no further action decision at Study Area P33, Ground Scar, at the Fort Devens Sudbury Training Annex in Middlesex County, Massachusetts. The report was prepared as part of the U.S. Department of Defense (DOD) Installation Restoration Program (IRP) to assess the nature and extent of contamination associated with site operations at the Sudbury Training Annex.

On February 21, 1990, the Sudbury Training Annex was placed on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The U.S. Army Environmental Center (USAEC), formerly the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), initiated a Master Environmental Plan (MEP) in 1991. Study Area P7 was identified in the MEP as a potential area of concern. In July 1991, DOD, through USAEC, initiated a Site Investigation/Remedial Investigation (SI/RI) for the sixty-eight areas identified by the MEP. The SI/RI was conducted by OHM Remediation Services Corp. (OHM). Study Area P7 was included in the SI/RI.

The activities involved in the OHM investigation qualified for a categorical exclusion (CX) in accordance with National Environmental Policy Act (NEPA), as amended, and did not require prior preparation of an environmental assessment or an environmental impact statement. The investigation qualified for CX following criteria set forth in Appendix A of Army Regulation 200-2.

The Sudbury Training Annex, acquired by the government in the early 1940s during World War II, is located approximately two miles north of the town of Sudbury, Massachusetts. It has historically served as a munitions holding ground, an ordnance test station, a research and development facility, and as a troop training ground. Currently, the facility contains family housing for armed services personnel, a geophysical radar station, and guest houses.

SECTION 2.0

BACKGROUND AND PHYSICAL SETTING

The Sudbury Training Annex is located 20 miles west of Boston, 12 miles northwest of Natick, Massachusetts and 2 miles northwest of the town of Sudbury in Middlesex County, Massachusetts. The installation is located in the Maynard, Massachusetts 7½-minute United States Geological Survey (USGS) quadrangle map. Figure 2-1 presents the site map.

Military operations began at the Annex in 1942, when formal petition was filed by the United States to acquire the land by eminent domain (District Court of United States for District of Massachusetts, Misc. Civil No. 6507, March 25). Transfer of the property (3,100 acres) occurred on November 10, 1942, and initial use of the property, then known as the Maynard Ammunition Depot, was to store ammunition for subsequent shipment to the Port of Boston. The location was selected due to its strategic location (out of range of naval guns) and close proximity to four active railroad lines. Provision of safe storage of ammunition was attained by the construction of 50 earth-covered concrete bunkers located in the center of the Annex. Railroad spurs were developed to provide access between bunkers and the main railroad lines. The railroad spurs were removed in 1966 and no munitions have been stored within the Annex bunkers since 1975.

After World War II, the Maynard Ammunition Depot became known as the Maynard Ordnance Test Station, and in 1957 was acquired by the Quartermaster Research and Engineering (QM R&E) Center to relieve restrictions this command was experiencing at Natick, Massachusetts due to the continuous influx of new projects. The QM R&E used the Annex for testing various materials associated with its mission of research and development in the physical, behavioral, and biological sciences and engineering of clothing and protective equipment. Physical research and development included airdrop techniques, field shelters and equipment, field organization equipment, food, and food service systems. Scientific research and development uses included determination of the stability of various fungicides in materials exposed to outdoor environments, foamed plastics field tests, flame testing of clothing and equipment, toxic fumigant effects on insects, the study of climatic data in support of various test programs, and airdrop testing.

In 1982, custody of the entire Annex was transferred to Fort Devens, which is located 17 miles northwest of Sudbury in the town of Ayer, Massachusetts. The major mission of Fort Devens is to train active duty and reserve personnel, and to support the U.S. Army Security Agency Training Center and School, U.S. Army Reserves, National Guard, ROTC, and Air Defense sites in New England. The Annex presently supports this mission.

2.1 DESCRIPTION AND LAND USE

The 4.3-square-mile Annex is comprised of sections of the towns of Sudbury, Maynard, Hudson, and Stow. The installation is divided into two irregularly shaped parcels by Hudson Road. Approximately 500 acres in the northern parcel of the Annex are leased to the USAF for radar instrumentation. This facility, located near the Assabet River, is supervised by personnel from Bedford Research Laboratories. The Region One Office of FEMA leases approximately 262 acres on the northern parcel, near the East Gate. A relatively flat area on the northern parcel, consisting of approximately 30 acres, is presently used as a drop zone by the Airdrop Engineering Laboratory for testing equipment in actual parachute drops. A number of individual housing units are scattered across the northern parcel of the Annex. In the southern

parcel of the Annex, the Capehart Family Housing Area (CFHA), a military family housing area, occupies approximately 18 acres and includes a small recreational area for children.

The installation is also used by a number of local groups, including Army Reserve units, the National Guard, the Massachusetts State Police, and permitted recreational users. Because of its easy accessibility, the site is also used by unauthorized persons.

2.2 CLIMATE

Site-specific meteorological data are recorded at the USAF radar installation and at the Natick Weather Station on the southern parcel of the installation. A review of meteorological data indicates moderately cold, moist winters and warm, moist summers. July is recorded as the warmest month with a mean temperature of 22.2 degrees Celsius (72 degrees Fahrenheit). Temperatures at or above 27 degrees Celsius (81 degrees Fahrenheit) generally occur between the months of June, July, and August, with the possibility of temperatures dropping below freezing during the months of December through March. Late summer to early fall months bring the possibility of hurricane-influenced weather patterns.

Annual precipitation is moderately abundant with an annual mean of 121 centimeters (44 inches) per year. Winter precipitation is usually in the form of snow with occasional ice storms. Precipitation is, for the most part, distributed evenly throughout the year. The driest months are July and October with mean precipitation of 8½ centimeters (3.3 inches), and the wettest months are March and November with mean precipitation of 12 centimeters (4.7 inches).

Summer precipitation is usually confined to short duration, high intensity thunderstorms (frontal and convective). Winds are light to moderate throughout the year.

2.3 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.3.1 Topography

The installation lies near the western boundary of the Seaboard Lowland Section of the New England-Maritime Physiographic Province. Elevations range from 321 feet above mean sea level (AMSL) along the northern boundary of the installation to 170 feet AMSL in Marlboro Brook on the southern parcel of the installation. The topography at the Annex is dominated by broad flat plains with elevations between 190 and 200 feet AMSL. Hills are scattered throughout the Annex, with most lying in an arc along the northern boundary and concentrated in the central section of the northern parcel. Topographic trends are generally north to south. A previous investigation classified the topographic features as follows: 81 percent lowlands, 16 percent hills, and 3 percent water bodies (USATHAMA, 1980).

2.3.2 Bedrock Geology

The Annex is underlain by igneous and metamorphic rocks of Pre-Cambrian(?) and Paleozoic Age. Six formations underlie the site as part of a tightly-folded, northeast-plunging asymmetrical anticline with a northeast-southwest strike. The Marlboro Formation, a fine-grained amphibolite schist (Pre-Cambrian?) is exposed on the Annex in a band extending from Vose Hill to White Pond. Two formations cross the southeast corner of the Annex: the Salem(?) gabbro-diorite and a quartz diorite facies of the Dedham granodiorite. Both formations are presumably of Devonian age. The Nashoba Formation (Carboniferous),

a light gray biotite gneiss, runs along the northern boundary of the site and underlies the extreme northwest corner of the Annex. Central and northern portions of the Annex are underlain by the Gospel Hill gneiss (Carboniferous). The Gospel Hill is a medium- to coarse-textured granite gneiss and is probably a granitized product of the Nashoba and Marlboro formations. Small bodies of the Assabet quartz diorite (Late Paleozoic?) crop out in northern portions of the site.

Bedrock across the site is closely folded with steep dips. Joints are common in the bedrock outcrops and are mostly vertical or nearly vertical. Joints at the surface were found to have a general northwestward trend. The occurrence and vertical orientation of the joints was confirmed at depth in the pilot hole near the northern boundary of the installation. All bedrock formations are dense and hard. No surface or subsurface indications of major faults were noted in the bedrock.

With the exception of widely-scattered outcrops, bedrock is covered by glacial deposits ranging in thickness from a veneer up to 120 feet. Field examination of the few outcrop locations and the results of the subsurface investigation indicated the bedrock surface to be highly irregular. Previous studies have indicated the existence of a buried bedrock valley beneath the southern parcel of the Annex and other abandoned stream channels in the area (Barnes, 1956).

2.3.3 Surface Geology

The surficial geology at the Annex is dominated by two glacial deposits: glacial till and outwash. Deposits of Recent age include alluvium and organic silt and peat.

Glacial till was deposited by the glacial ice sheet and rests directly on bedrock. When exposed at the surface, till forms both ground moraine and drumlins. As ground moraine, the till creates an irregular blanket on the bedrock surface. Tuttle Hill has been classified as ground moraine (Hansen, 1956). Till also forms drumlins, which are scattered across the Annex (Vose Hill, Hill 321, and Hill 235), and whose long axes have a crude northwesterly alignment.

Glacial till at the Annex is a compact, poorly sorted mixture of soil with grain sizes ranging from clay to boulders. Due to its compactness and poor sorting, till has a low permeability which retards the movement of ground water. At some locations at the Annex, however, the till was found to contain heavily oxidized fissures which greatly increased the flow of ground water.

Over most of the Annex, the glacial till is overlain by glacial outwash. The glacial outwash forms broad plains of well-stratified sand and gravel locally trenched by streams and pitted by shallow depressions containing lakes or swamps. Disregarding the soil zone and thin deposits of Recent age, the outwash is the uppermost deposit across nearly the entire installation.

The glacial outwash plains are of two major types: proglacial deposits and ice-contact deposits. Proglacial deposits were laid down by melt-water streams issuing from the ice margin. These deposits are fine to coarse textured and well stratified. Beneath this upper deposit is a lower zone composed chiefly of beds of gray, very fine sand and silt representing lake-bottom deposits. This lithologic sequence was encountered in the deep boring along White Pond Road, near Patrol Road. Ice-contact deposits on the Annex were laid down against the ice or in holes within the ice, forming roughly circular hills called kames. The stratification of the deposits ranges from poor to good, and the grains range in size from clay

to cobble. Examples of ice-contact deposits can be found near the northern and eastern boundaries of the Annex, where groups of kames have been closely spaced and form kame fields.

Recent deposits are relatively thin and restricted in distribution. They consist of alluvium composed of reworked outwash sand and gravel deposited along stream channels, of gray organic silt and peat deposited on lake bottoms and in swamps, and of loess-like deposits of uniform brown fine sand. The peat and organic silt locally retard the movement of water into or out of the outwash.

2.3.4 Soils

Generalized stratigraphic units prevalent across the site are soil, outwash, till, and bedrock. Weathering of the glacial deposits and the bedrock could have produced the existing soil, while in certain areas, erosion may have removed this soil. Surface soils developed on the kame landforms, the outwash plain, and the alluvium are sandy loam with lenses of gravel. Soils in the lowland swamps and bogs are composed of muck and peat. Soils developed on ground moraines and drumlins are stony loam.

2.3.5 Drainage

Glaciation has profoundly affected surface drainage at the site. Accumulation of glacial debris within the preglacial stream valleys has not only caused streams to alter their course, but in some places disrupted drainage entirely. Drainage on the Annex as a whole is poorly integrated as indicated by the numerous swamps, ponds, and small water holes. Previous geologic investigations have determined that the Assabet River once flowed across the Annex in a southeast trend from Boons Pond, beneath the southern shore of White Pond, and then curving to the northeast towards Hudson Road (Hansen, 1953). The cut of this earlier channel has been located at depths between 80 and 120 feet below ground level through seismic and test drilling surveys (Barnes, 1956; Perlmutter, 1962).

The northern parcel of the Annex lies within the drainage basin of the Assabet River, which flows along the northwestern perimeter of the installation. Taylor Brook, flowing north to the river, is the largest stream draining the area. Honey Brook, Taylor Brooks' major tributary, flows northeastward in a man-made channel along a bunker access path. The southern parcel of the Annex is within the drainage basin of the Sudbury River. The largest stream in the area, Marlboro Brook, flows southeastward from the former railroad classification yard towards the installation boundary.

2.3.6 Hydrogeology

The overburden water-bearing zone is a glacial deposit, consisting of glacial outwash, glacial till, and glacial moraine deposits. The glacial outwash is the most permeable zone and consists of stratified silt, sands and gravel. Ground water flow conditions within the outwash are controlled by changes in the surficial geology, the areal extent of the outwash, and by the less-permeable boundary conditions created by glacial till and bedrock. The glacial till is a dense, poorly sorted mixture of clay, silt, sand, gravel, and boulders. The till has a low hydraulic conductivity and does not provide an appreciable source of water (less than 10 gpm).

Bedrock is hydraulically connected with the overburden. Due to the composition of the bedrock and the slight fracturing observed in the rock cores, the bedrock water-bearing zone may have a very low primary and secondary porosity. This hypothesis is supported by previous studies (Perlmutter, 1962), and by the

low hydraulic conductivity values (2×10^{-5} ft/min) found during the OHM investigation. Although the bedrock does transmit water, the configuration and depth of the bedrock surface have greater influence of the ground water flow regime than does its water-yielding characteristics.

Depth to ground water is relatively shallow, ranging from flowing artesian conditions to 15 feet below ground surface (BGS). On topographic highs, the water table has been measured at depths to 30 feet BGS. The ground water elevation, hydraulic gradient, and flow direction roughly mimic ground surface topography and drainage.

The hydraulic conductivity of the overburden unit varies greatly across the Annex. The portions of the site with the highest permeability were near the southwestern boundary of the installation, and at the western side of the site, near Patrol Road and White Pond Road. The region with the lowest permeability was the eastern portion of the site, and the study areas around Puffer Pond. The highest hydraulic conductivity reported in the literature was from a location in a buried river valley beneath the southern parcel of the installation.

A pumping test was conducted on the abandoned Maynard water supply well installed within the buried valley (Perlmutter, 1962). The pumping test determined the overburden formation to have a hydraulic conductivity of 800 gpd/ft² (8×10^{-2} ft/min), with a storage coefficient of 0.20. Slug tests conducted during the OHM investigation in this vicinity produced results similar to those of the pumping test (2×10^{-2} ft/min).

In locations where the outwash is thick and permeable, the unit can yield approximately 100 gallons per minute. Results of a pump test performed in the 1970s on Maynard Town Well No. 3 reported well yields of 700 gpm.

2.4 STUDY AREA DESCRIPTION AND HISTORY

Area P33, Ground Scar, was identified by the USEPA in the Installation Assessment conducted on Natick Laboratories and the Sudbury Training Annex (USEPA, 1982). Aerial photographs indicate that the area was related to local farm activity. The area is relatively flat and is bordered by a swamp to the west. Thick vegetation surrounds the area, and a small stream drains the area to the east toward Stearns Mill Pond.

2.5 RELATED INVESTIGATIONS

In 1978, the DOD established the IRP. Under the IRP, the DOD sought to identify, investigate, and clean up contamination from hazardous substances at federal facilities. Environmental investigations were started at the Annex in 1980 under the IRP in order to address the environmental impact of past land usage.

To date, the following organizations have conducted investigations at the Annex funded under the IRP:

- USAEC in 1980
- United States Army Environmental Hygiene Agency in 1983
- Dames & Moore of Bethesda, Maryland in 1986 and 1991
- OHM, Final Master Environmental Plan in 1992
- OHM, Site Investigation/Remedial Investigations in 1993.

A number of other investigations have been performed at the Annex. NUS Corporation (1985/1987), as a contractor to USEPA, conducted a preliminary assessment/site investigation (PA/SI) at the site in fulfillment of the requirements of CERCLA. SEA Consultants, Inc. (1991) conducted an environmental assessment/ environmental impact study for the Massachusetts Air National Guard at the western boundary of the Annex. GZA Geoenvironmental (1991) conducted a site investigation near the eastern boundary of the Annex, as a contractor to the U.S. Army Corps of Engineers, under the Defense Environmental Restoration Program.

The Site Investigation/Remedial Investigation Report (OHM, 1993) presents a summary of the investigations conducted by each of the above organizations. The following sections present a summary of the investigations conducted in Study Area P33.

2.5.1 Master Environmental Plan

The MEP was initiated in 1991 as part of the IRP action at the Annex. The MEP was completed by OHM in 1992, under direct contract to USAEC, and listed sixty-eight study areas. Ground Scar was designated as Study Area P33.

The study conducted under the MEP consisted primarily of a review of existing studies and identification of potential environmentally significant areas. Area P33 was designated as a possible area of contamination and the MEP recommended that an enhanced area reconnaissance be performed.

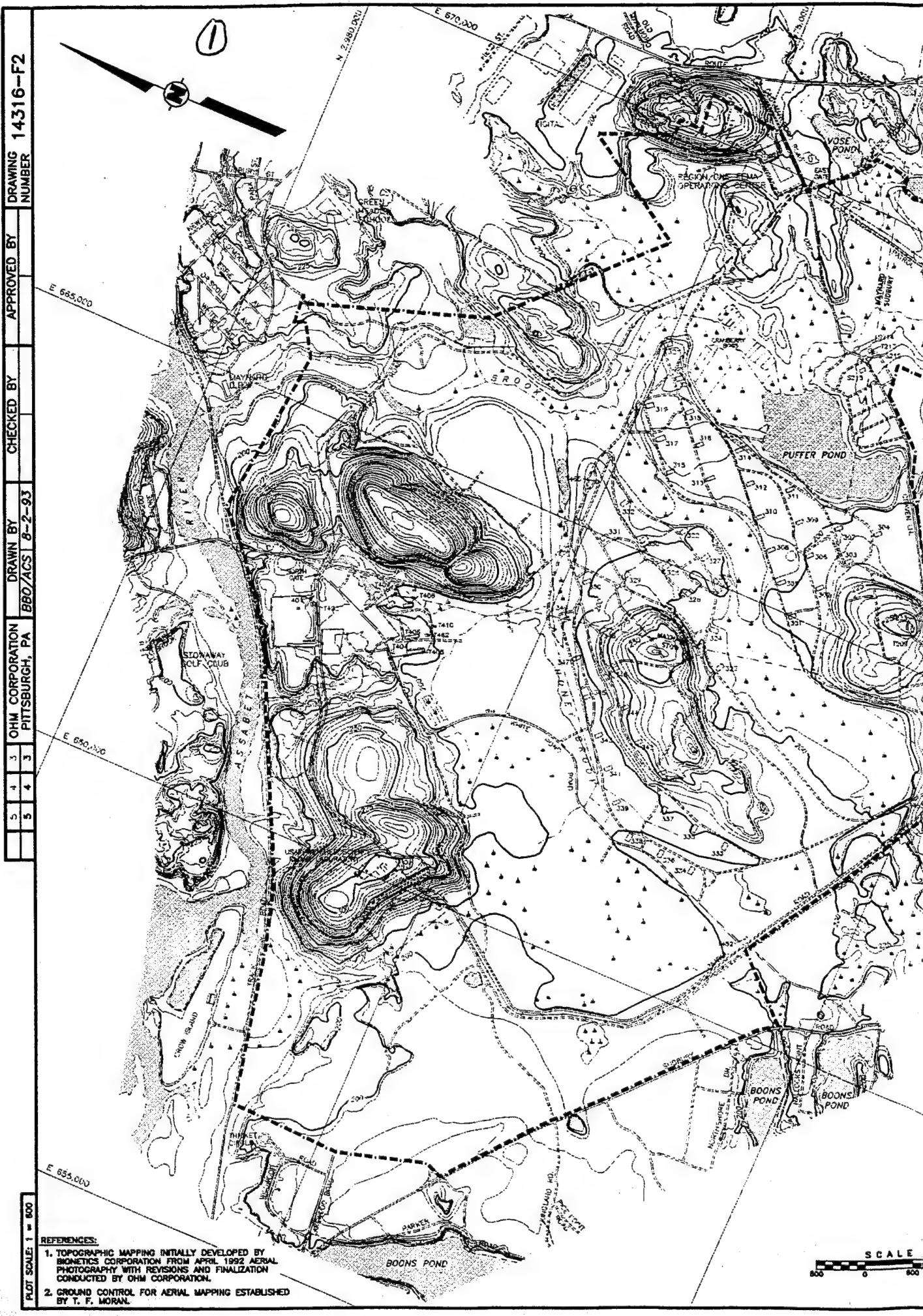
2.5.2 Enhanced Area Reconnaissance

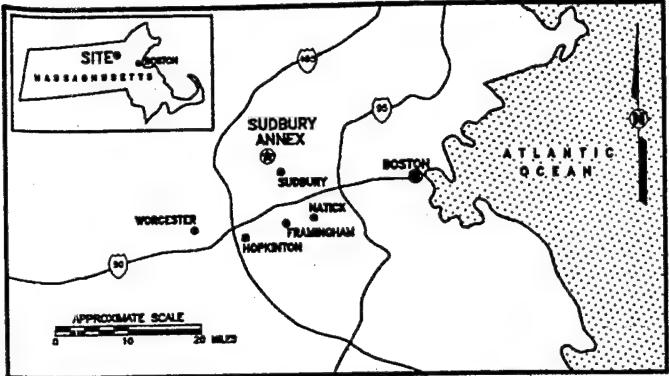
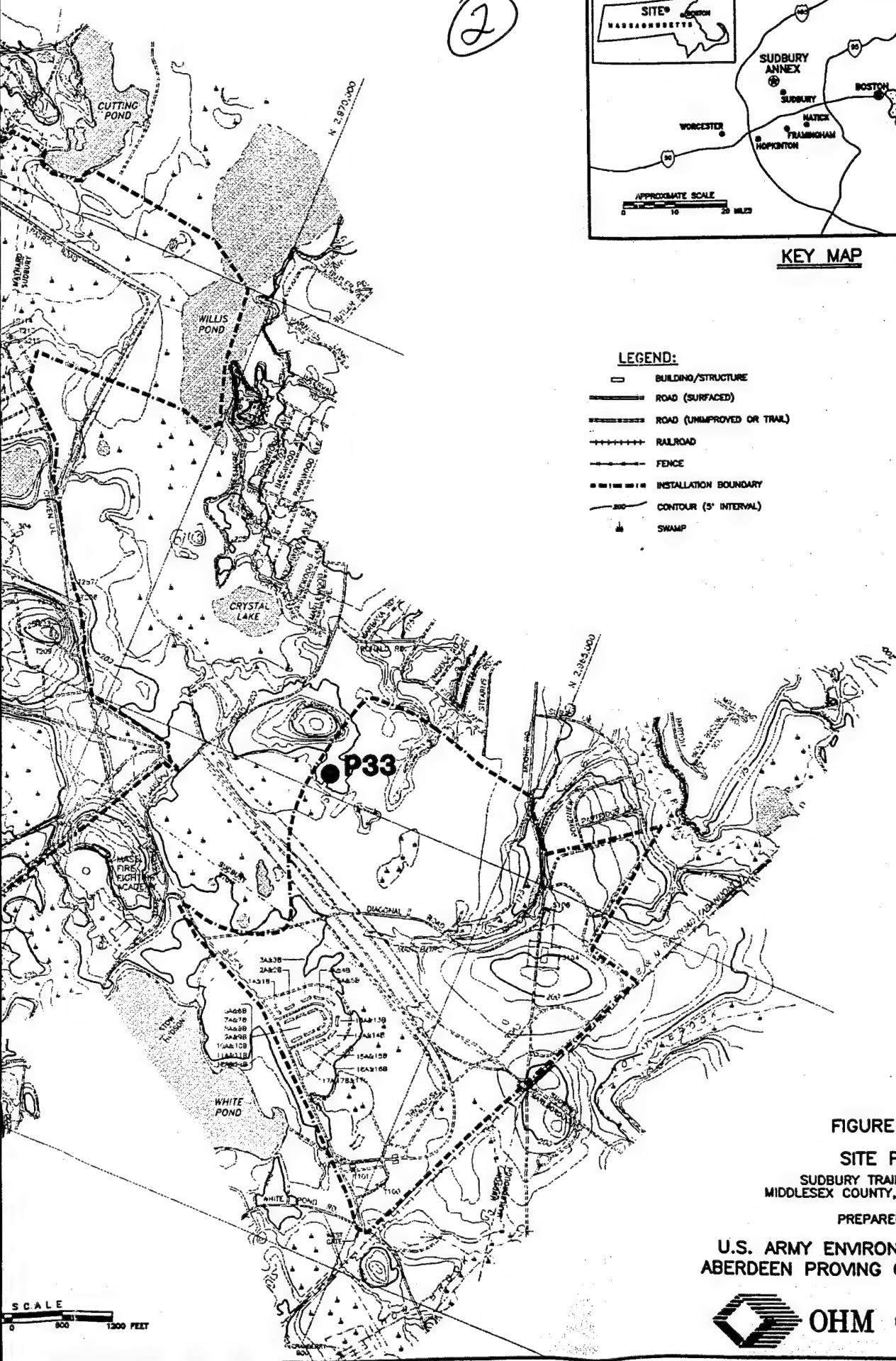
An enhanced area reconnaissance (EAR) was performed at Area P33 by OHM, under contract to USAEC, in 1992. The EAR is a starting point for the field investigation and serves to qualitatively evaluate environmental conditions within a potential area of concern. Results of the EAR are used to determine the appropriate course of action for the study area. Subsequent actions involve either removing the area from further consideration through the use of a No Further Action Decision Document, or elevating the field investigation to a site remedial investigation.

The objectives of the investigation at Area P33 were to identify stressed vegetation, drums, surface debris, or other evidence of disposal in and around the study area. The technical approach and the results of the EAR at this study area are presented in Section 4.0.

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PLOT SCALE: 1 = 800





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SECTION 3.0

AREA-SPECIFIC CHARACTERISTICS

Area P33 is located on the southern parcel of the Annex, 1,200 feet east of the former railroad classification yard and 1,000 feet south of Hudson Road. Figure 3-1 presents a map of the area. The surficial geology of this area has been classified as outwash plain (Hansen, 1956). The area is relatively flat and is bordered by swamp to the west. Thick vegetation surrounds the area.

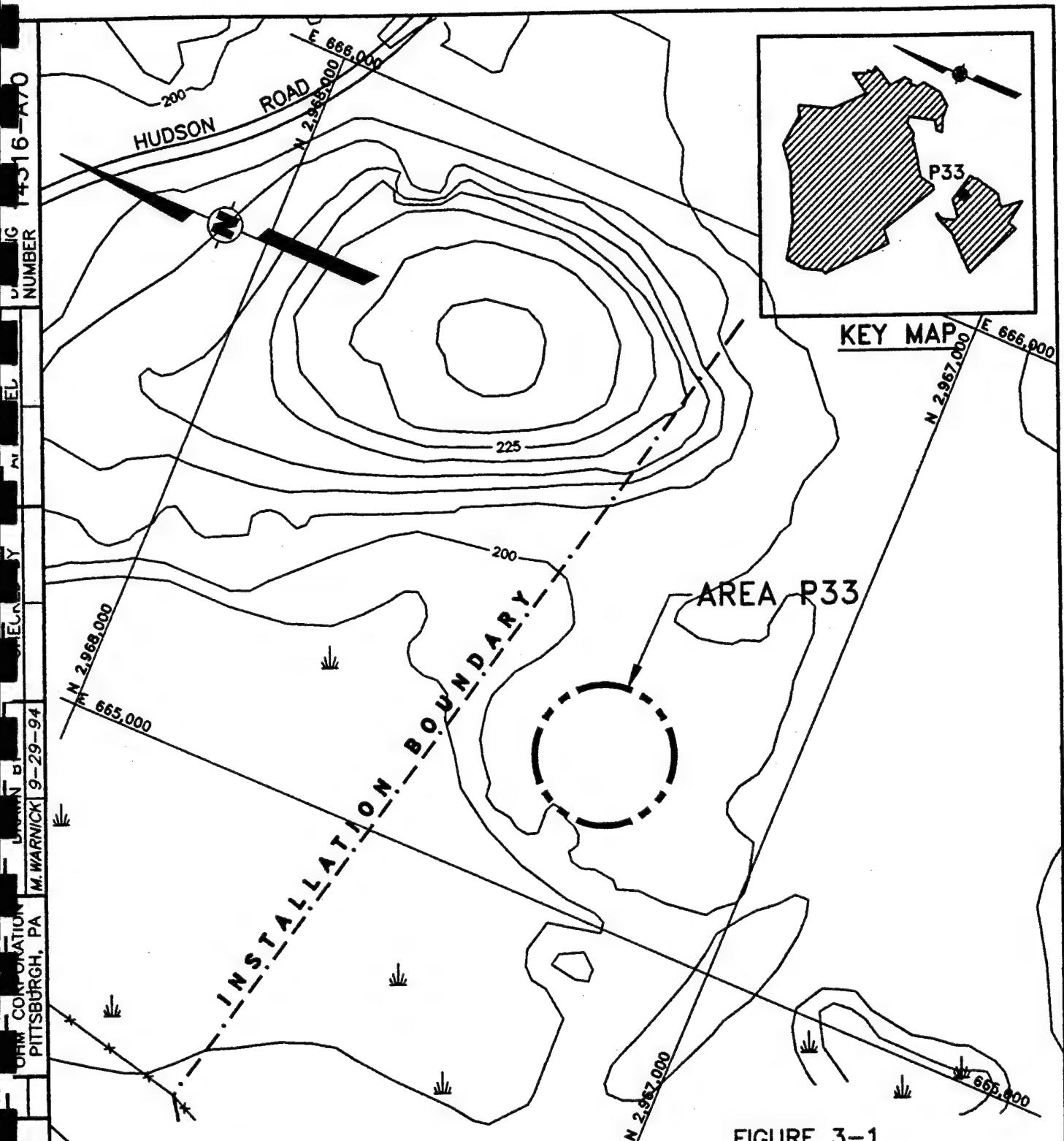


FIGURE 3-1

**AREA P33
SITE MAP
SUDSBURY TRAINING ANNEX
MIDDLESEX COUNTY, MASSACHUSETTS**

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SECTION 4.0

CONTAMINATION ASSESSMENT

In 1985, a site reconnaissance of Area P33 was performed by Dames & Moore, USAEC, Fort Devens, and the MADEQE. No evidence of contamination was identified during the reconnaissance, therefore no samples for laboratory analysis were collected. The ground scar, as identified on aerial photographs, appeared to be related to local farm activity.

The EAR was performed by OHM in 1992 to identify stressed vegetation, drums, surface debris or other evidence of disposal in and around the area. The procedure for enhanced area reconnaissance is detailed in the Site Investigation/Remedial Investigation Report (OHM, 1993). No evidence of contamination was identified during the reconnaissance. Many small clearings on both sides of the dirt road were observed. Construction debris consisting of wood, concrete and trash was found in a few of the clearings and an area of stressed vegetation was noticed in the eastern most clearing. A marsh was found south of the area along an old over grown road. The road was evidenced by tire ruts in the ground surface. No samples for laboratory analysis were collected as part of the EAR.

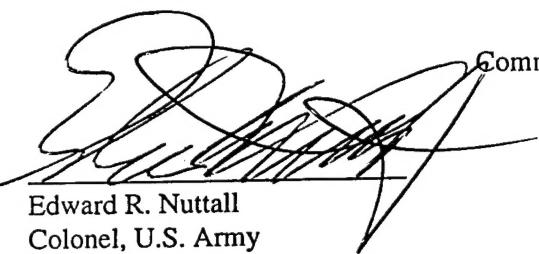
SECTION 5.0 CONCLUSION

Based on the results of the EAR at Area P33 (Ground Scar) it is concluded that no further investigation or remediation is required at this study area. There have been no interviews or reports identifying any Army-related activities in this area. Other than the refuse found in a few of the clearings, the area seems undisturbed. Nothing unusual is noted about the area and the surroundings are heavily vegetated, providing no reason to conclude the area may be a possible source of contamination or that the area has been adversely impacted.

The decision of no further action is protective of human health and the environment due to the fact that no evidence of possible contamination was identified in the area.

SECTION 6.0 DECISION

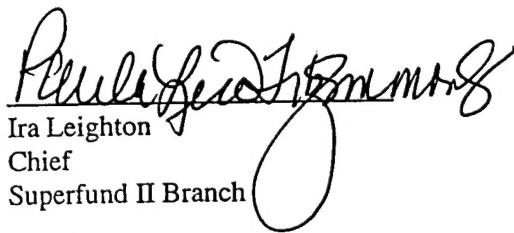
On the basis of study at Area P33, Patrol Road Waste Area, there is no reason or evidence to conclude that activities at this location have caused significant environmental contamination or pose a threat to human health or the environment. The decision has been made to remove Area P33 from further consideration in the Installation Restoration Program and the Comprehensive Environmental Response, Compensation, and Liability Act, as amended.

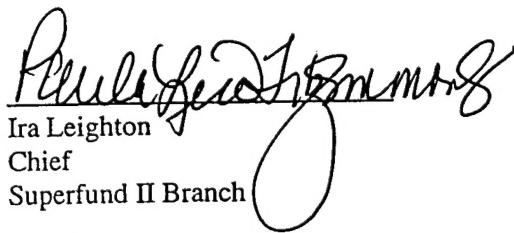

Commander, Fort Devens

Edward R. Nuttall
Colonel, U.S. Army
Commanding


Date

U.S. Environmental Protection Agency
Region I, Federal Facilities Office


Ira Leighton
Chief
Superfund II Branch


Date

Concur

Non-concur (please provide reasons)

SECTION 7.0 REFERENCES

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